JC06 Rec'd PCT/PTO 12 JAN 2001

FORM PTO-1390 (REV 11-98) — US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
P/61815-PCT	09/743774

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/GB00/02237	06/08/2000	06/17/1999 and 06/02/2000

TITLE OF INVENTION **MESH NETWORKS**

APPLICANT(S) FOR DO/EO/US **Geoffrey CHOPPING, Thomas Slade MADDERN**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371 (f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 37 (b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371 (c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C.371(c)(3)).
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: **Forms PCT/RO/101; PCT/IB/304; 308**

500 Rec'd PCT/PTO 12 JAN 2001

U.S. APPLICATION NO (If known, see 37 CFR 1.5) 09/743774	INTERNATIONAL APPLICATION NO PCT/GB00/02237	ATTORNEY'S DOCKET NUMBER P/61815-PCT

17. ☒ The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a)(1) - (5)) : Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1,000.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $860.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $760.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) $690.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$860 .00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	$0.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	5 - 20 =	0	X **$18.00**	$0.00	
Independent claims	2 - 3 =	0	X **$80.00**	$0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$0.00	
TOTAL OF ABOVE CALCULATIONS =				$860.00	
Reduction of ½ for filing by small entity, if applicable, A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				$860.00	
SUBTOTAL =				$860.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				$0.00	
TOTAL NATIONAL FEE =				$860.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$0.00	
TOTAL FEES ENCLOSED =				$860.00	
				Amount to be: refunded	**$**
				charged	**$**

a. ☒ A check in the amount of **$860.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 11-1145 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **11-1145**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

KIRSCHSTEIN, OTTINGER, ISRAEL & SCHIFFMILLER, P.C.
489 Fifth Avenue
New York, New York 10017
(212) 697-3750

SIGNATURE:

Alan Israel
NAME

27,564
REGISTRATION NUMBER

09/743774

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as Express Mail No. EL 337 913 361 US in an envelope addressed to: Box: PCT, Commissioner of Patents and Trademarks, Washington, D.C., 20231, on: January 12, 2001 (date)

Alan Israel
Reg. No. 27,564

International Application No.	:	PCT/GB00/02237
International Filing Date	:	June 8, 2000
In re: Application of	:	Geoffrey CHOPPING, et al.
Deposited	:	January 12, 2001
For	:	MESH NETWORKS

New York, New York
January 12, 2001

PRELIMINARY AMENDMENT

BOX: PCT
Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee and before examination, kindly amend the above captioned application as follows:

IN THE SPECIFICATION:

Page 1, between the title and the first line of text, insert the following heading:

-- BACKGROUND OF THE INVENTION --;

between lines 26 and 27, insert the following heading:

-- SUMMARY OF THE INVENTION --; and

at line 34, after "network", insert -- . --.

Page 2, between lines 10 and 11, insert the following heading:

-- BRIEF DESCRIPTION OF THE DRAWINGS --;

between lines 23 and 24, insert the following heading:

--DETAILED DESCRIPTION OF THE

PREFERRED EMBODIMENTS --;

line 30, change "recognised" to -- recognized --; and

line 41, change "an" to -- a --.

IN THE CLAIMS:

Page 4, change the subtitle "CLAIMS" to -- WE CLAIM --.

Please amend the claims as follows:

Claim 3, line 1, delete "or 2".

IN THE ABSTRACT:

Delete the "Abstract" on the PCT cover sheet and replace it with the "Abstract of the Disclosure" set forth on a separate sheet attached hereto.

REMARKS

Headings have been added to the specification; an abstract has been provided on a separate sheet; and the claims have been amended to conform to U.S. practice.

Wherefore, an early action on the merits is earnestly solicited.

Respectfully submitted,

KIRSCHSTEIN, OTTINGER, ISRAEL & SCHIFFMILLER, P.C.
Attorneys for Applicant(s)
489 Fifth Avenue
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Tel: (212) 697-3750
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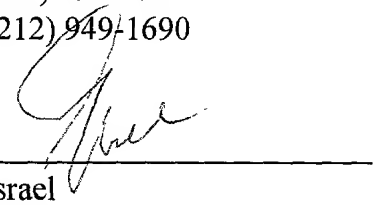

Alan Israel
Registration No. 27,564

-- **ABSTRACT OF THE DISCLOSURE**

A telecommunications network having a plurality of mesh nodes, where each mesh node includes one or more switches and at least one of the mesh nodes includes a plurality of switches, each mesh node having a connection to each other mesh node and each mesh node having associated with it a respective plurality of local nodes, each switch of each mesh node being connected to all of the respective associated plurality of local nodes. The network may be upgraded by adding a further switch to a mesh node and connecting all the respective local nodes to that switch and sharing the connections between the switches of the mesh node. A suitable network routing algorithm controls the routing in the network. --

MESH NETWORKS

In networks, such as telecommunication networks, fully meshed networks are often used to interconnect the nodes together and in particular to interconnect trunk exchanges. Although fully meshed networks can be of considerable use, they do have the characteristic that the more nodes there are in a fully meshed network, then the narrower the routes between nodes have to be once the switches are port limited. Doubling the nodes in a fully meshed network can halve the size of each route across the mesh. However, reducing the route size can increase the chance of blocking as well as reducing the Erlang efficiency.

In some telecommunication networks each fully meshed trunk exchange is also connected to several local exchanges, so that the longer distance trunk calls tend to traverse four exchanges namely a local, a trunk, a second trunk and a final local.

In such a network the local exchanges only need to know if a call originating on its own exchange cannot be terminated on its own exchange, in which case the call is forwarded to a trunk exchange.

For reasons of redundancy a local exchange is normally connected to more than one trunk exchange, in which case a call which cannot be terminated on its own exchange can probably be forwarded to any of the connected trunk exchanges.

However if the local exchanges are connected to more trunk exchanges than are needed for redundancy reasons, then the local exchange could be asked to perform part of the overall trunk routing algorithm. Consequently the intended final destination of the call can be used to decide to which trunk exchange the call should be sent to by the local exchange.

Provided the local exchange is able to route to more than one trunk exchange depending on the destination of the call, then it is possible to use a pair of trunk exchanges to perform the function of one existing trunk exchange, with approximately twice the capacity and throughput. This is assuming that the two exchanges each have the same or similar capacity to the existing trunk exchange. The existing trunk exchange can be one of the pair of trunk exchanges. The pair of trunk exchanges can be known as Siamese trunk exchanges.

According to the present invention there is provided a telecommunications network comprising a plurality of mesh nodes, each mesh node including one or more switches, at least one of the mesh nodes including a plurality of switches, each mesh node having a connection to each other mesh node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and each mesh node having associated therewith a respective plurality of local nodes, each switch of each mesh node being connected to all of the respective associated plurality of local nodes and including a network routing algorithm to control the routing in the network

There is further provided a method of upgrading a telecommunications network, said telecommunications network comprising a plurality of mesh nodes, wherein each mesh node includes at least one switch, each mesh node having a direct connection to each other mesh

node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and the switch or switches of each mesh node being each connected to all of a respective plurality of multiple local nodes, the method comprising the steps of :-

(a) adding a further switch to at least one of the mesh nodes;

(b) connecting all of the respective plurality of local nodes to the further switch;

(c) providing a network routing algorithm to control the routing in the network; and

(d) dividing the connections from the at least one mesh node to the switches of the other mesh nodes between the switch or switches and the further switch of the at least one mesh node.

The present invention will now be described by way of example, with reference to the accompanying drawings in which:

Figure 1 shows an example of a network having a number of fully meshed mesh nodes;

Figure 2 shows an example of a fully meshed mesh node of the network shown in Figure 1 connected to multiple local nodes;

Figure 3 shows an example of a fully meshed mesh node of the network shown in Figure 1 with a single switch;

Figure 4 shows an example of a fully meshed mesh node of the network shown in Figure 1 with two unconnected switches;

Figure 5 shows an example of a fully meshed mesh node of the network shown in Figure 1 with two connected (Siamese) switches; and

Figure 6 shows an example of a network as shown in Figure 1 including a number of fully meshed mesh nodes where each node has two switches.

Figure 1 shows an example of a network having fully meshed mesh nodes, such as trunk exchanges, where each mesh node is directly connected to every other mesh node. In practice these links are often carried by transmission systems.

In Figure 2 some of the mesh nodes (trunk exchanges) of Figure 1 are shown connected to multiple local nodes, such as local exchanges. In practice these connections are often carried by transmission systems. The connection of multiple local exchanges to trunk exchanges is a recognised telecommunication network configuration.

Figure 3 shows a mesh node of Figure 2 containing a single switch. Such a switch could be a trunk exchange equipment. This switch is connected to all the other mesh Nodes as well as all the illustrated multiple Local Nodes. The illustrated Local Nodes may also be connected to switches at other mesh nodes.

Figure 4 shows the mesh node of Figure 3, to which has been added a further switch. Any added switches could be trunk exchanges. The direct links from the other mesh nodes are taken to one or the other, but not both, of the switches. The pair of switches are both connected to all the multiple local nodes associated with that mesh node. The local nodes have to be able to route calls or messages to the appropriate one of the pair of switches.

Figure 5 shows the mesh node containing two switches as in Figure 4, but with a connection (Siamese link) between them. If the connection between an local node and the switch that is normally used to route a call or message is congested, then if the connection to the other one

of the pair of switches is not congested then this connection and the Siamese link can be used in series, to avoid the congestion. The Siamese link is not essential, but can be a useful feature for practical networks.

Figure 6 shows an example of a network where all the Mesh Nodes each have two switches, each pair of switches within a mesh node being joined by a Siamese link. The overall result is that each switch is connected to approximately one half of the other mesh nodes and approximately one quarter of the other switches. For larger examples the approximations can be more precise, but there is no basic need to equally divide the routes between the mesh nodes and the switches. Some routes may naturally carry more traffic and some pairs of switches may not have identical characteristics to each other.

The network will require a network routing algorithm to control the routing of messages, of whatever form through the network.

CLAIMS

1. A telecommunications network comprising a plurality of mesh nodes, each mesh node including one or more switches, at least one of the mesh nodes including a plurality of switches, each mesh node having a connection to each other mesh node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and each mesh node having associated therewith a respective plurality of local nodes, each switch of each mesh node being connected to all of the respective associated plurality of local nodes and the network including a network routing algorithm to control the routing in the network.

2 A telecommunications network as claimed in Claim 1, wherein one or more local nodes are connected to more than one mesh node.

3. A telecommunications network as claimed in Claim 1 or 2, wherein the plurality of switches of a mesh node are connected.

4. A method of upgrading a telecommunications network, said telecommunications network comprising a plurality of mesh nodes, wherein each mesh node includes at least one switch, each mesh node having a direct connection to each other mesh node by means of a connection between a switch at the one mesh node and a switch at the other mesh node and the switch or switches of each mesh node being each connected to all of a respective plurality of multiple local nodes, the method comprising the steps of :-
(a) adding a further switch to at least one of the mesh nodes;
(b) connecting all of the respective plurality of local nodes to the further switch or switches;
(c) providing a network routing algorithm to control the routing in the network; and
(d) dividing the connections from the at least one mesh node to the switches of the other mesh nodes between the switch or switches and the further switch of the at least one mesh node.

5. A method of upgrading a telecommunications network as claimed in Claim 4, further including the step of making a connection between the switches of the at least one mesh node.

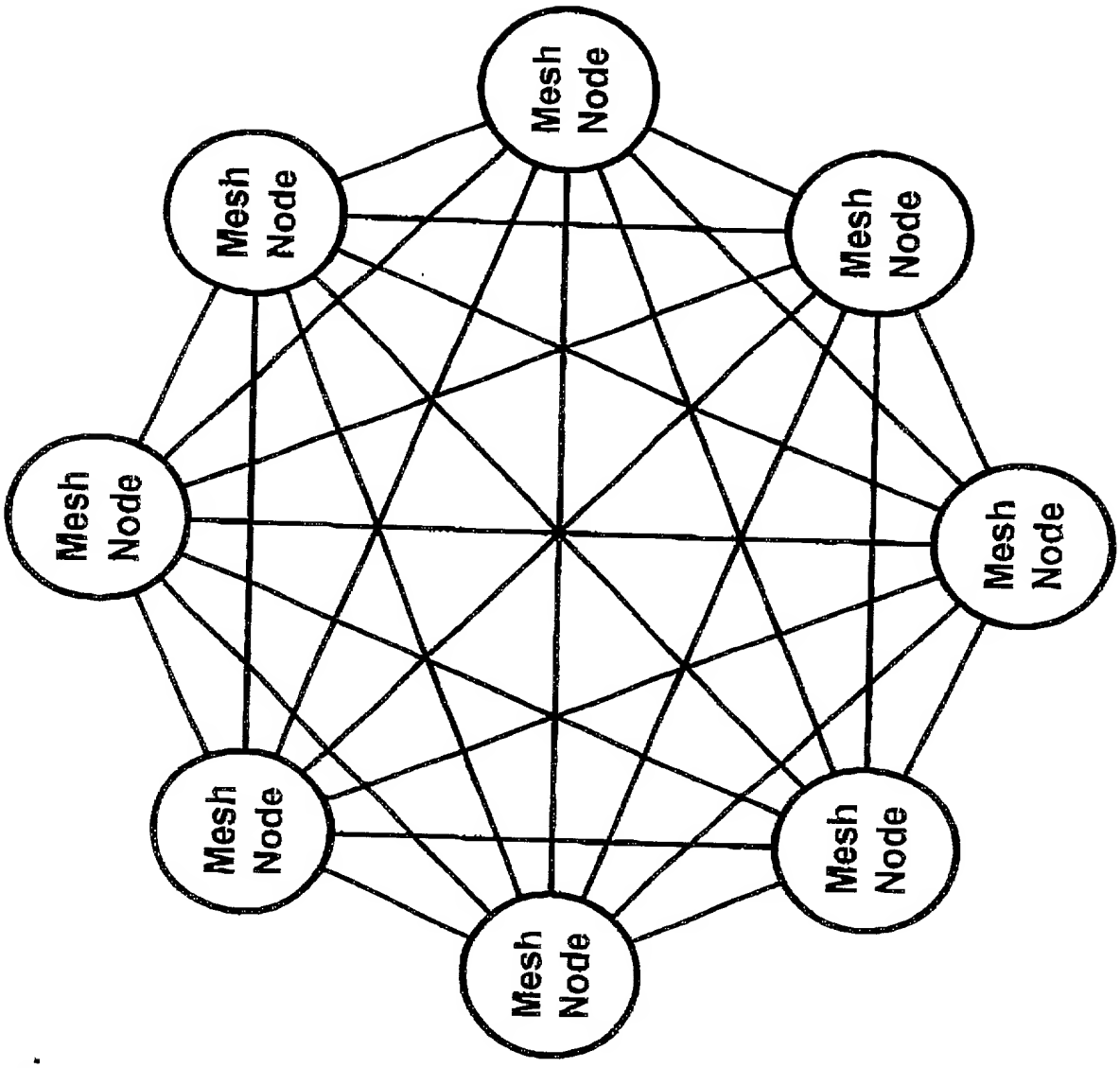
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node

Fig.1.

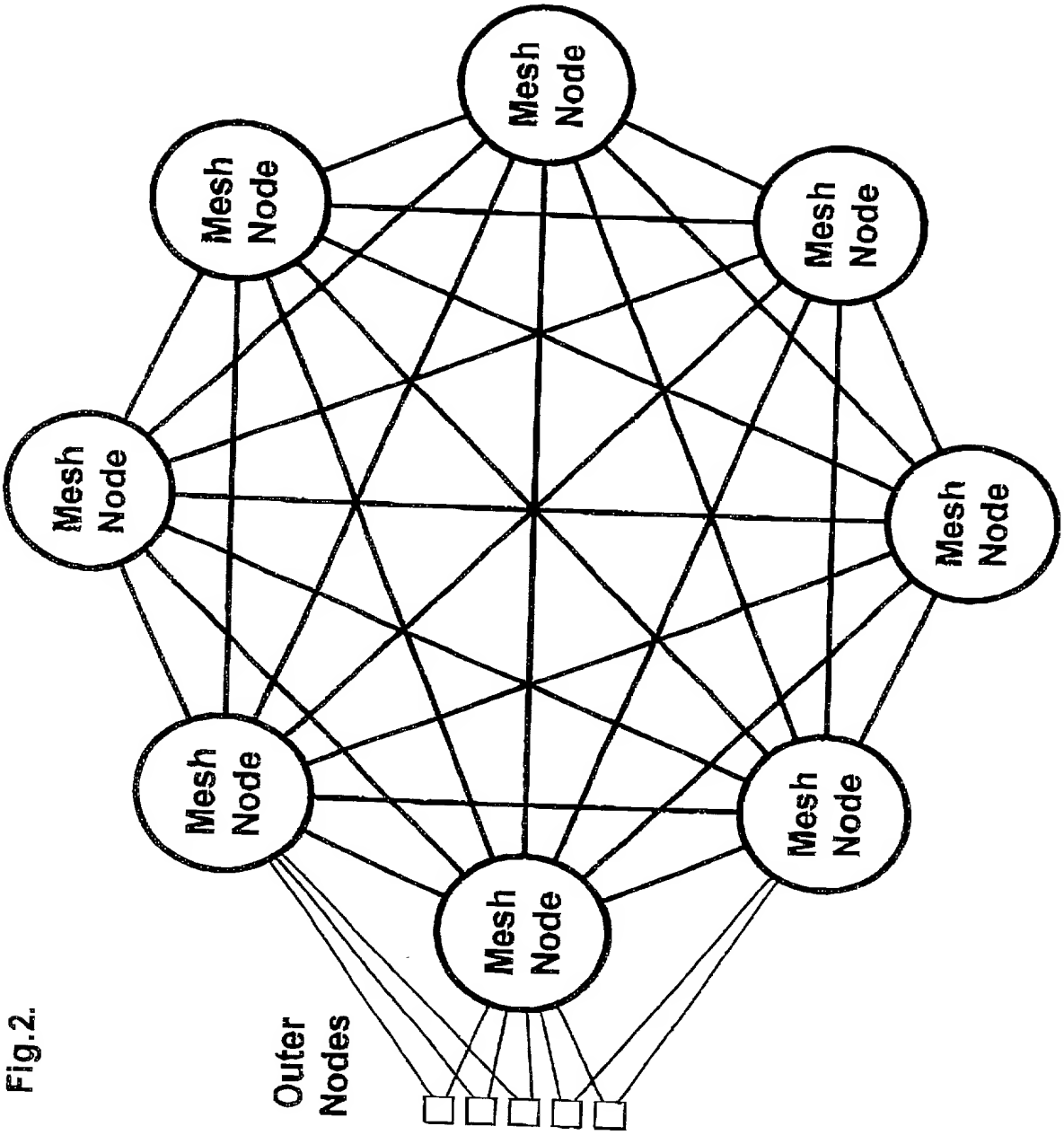
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Mesh Node
Outer Nodes

Fig.2.

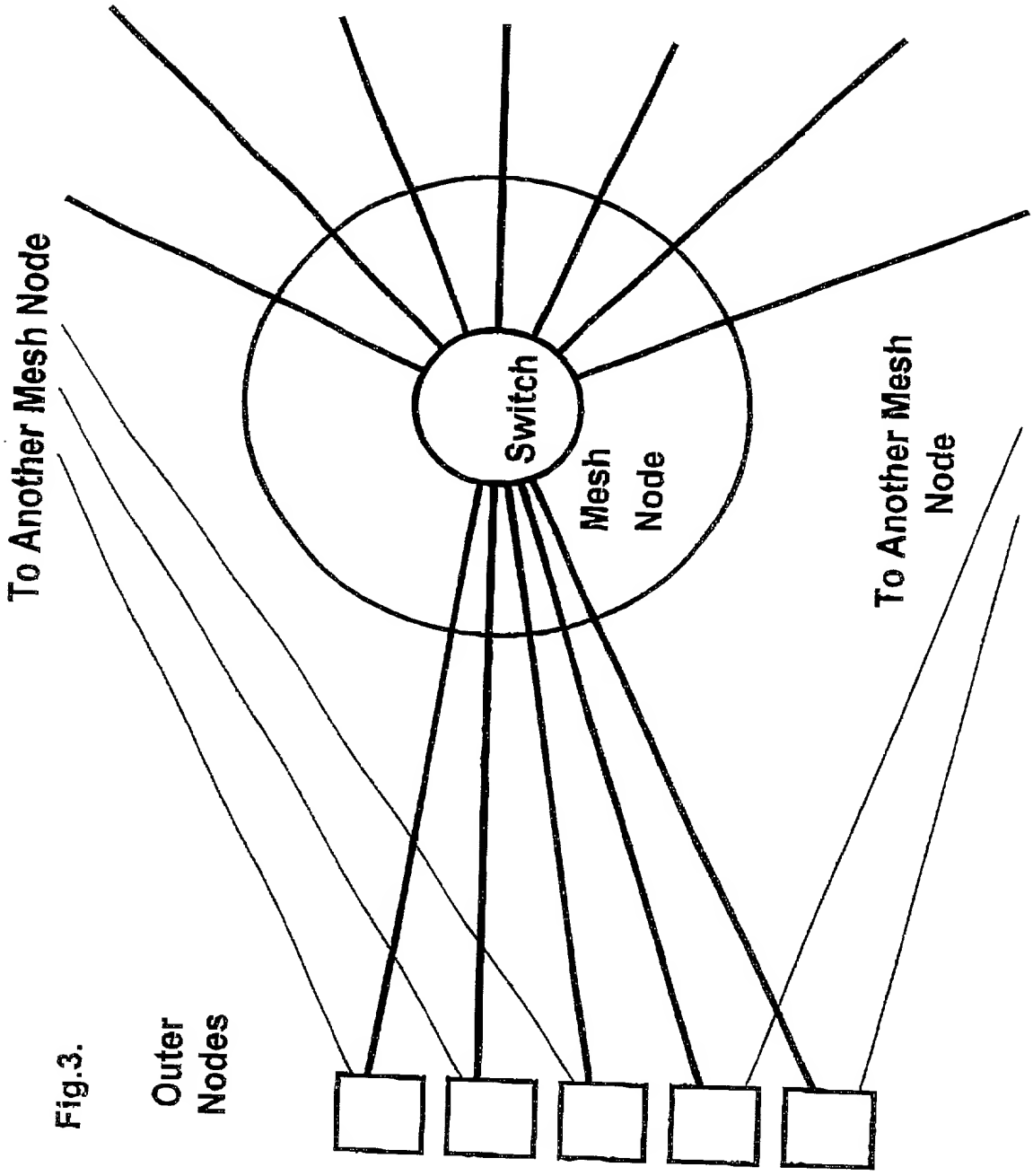
To Another Mesh Node
Switch
Mesh
Node
To Another Mesh
Node
Outer
Nodes

Fig.3.

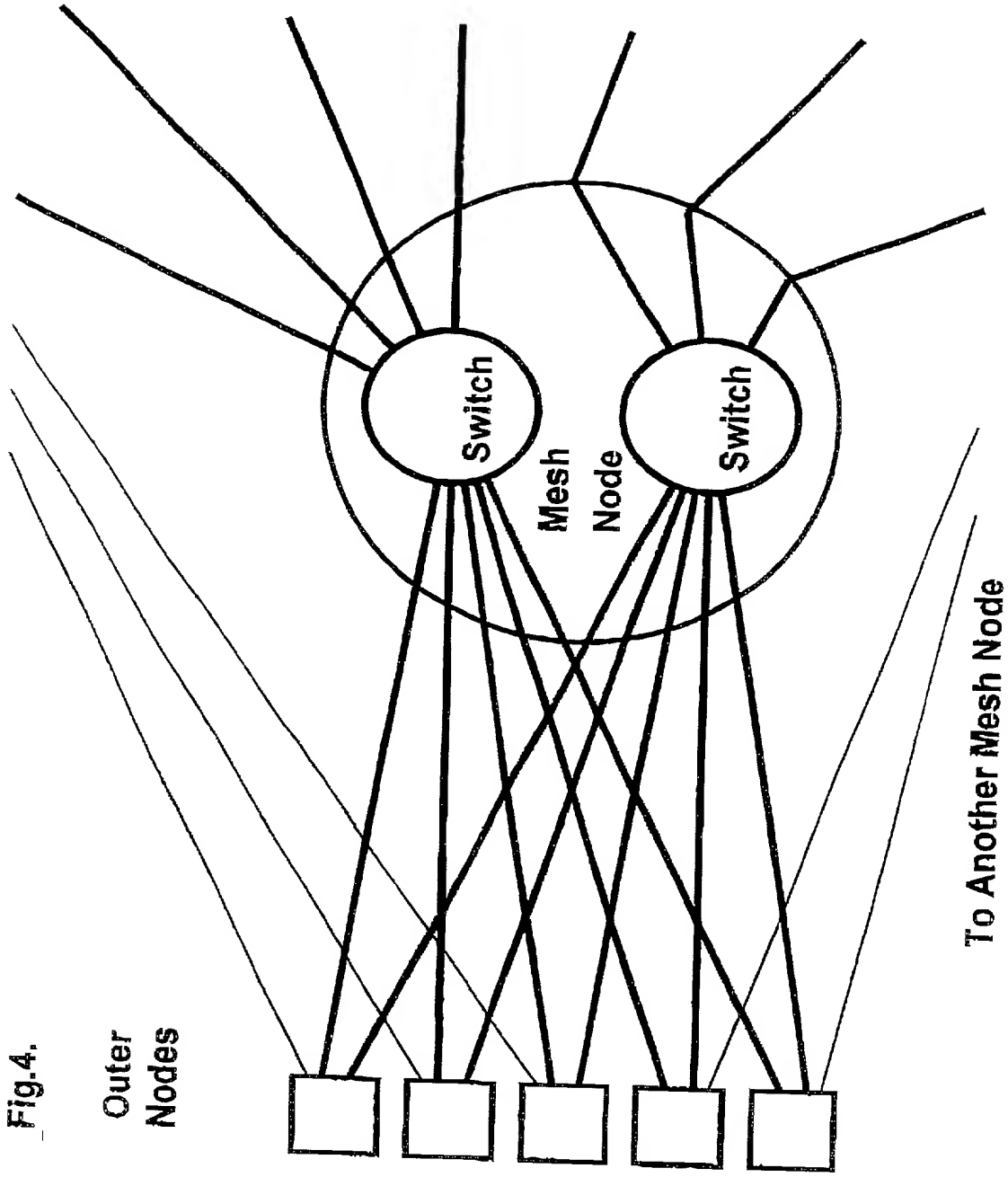
To Another Mesh Node
Switch
Mesh
Node
Switch
To Another Mesh Node
Outer
Nodes

Fig.4.

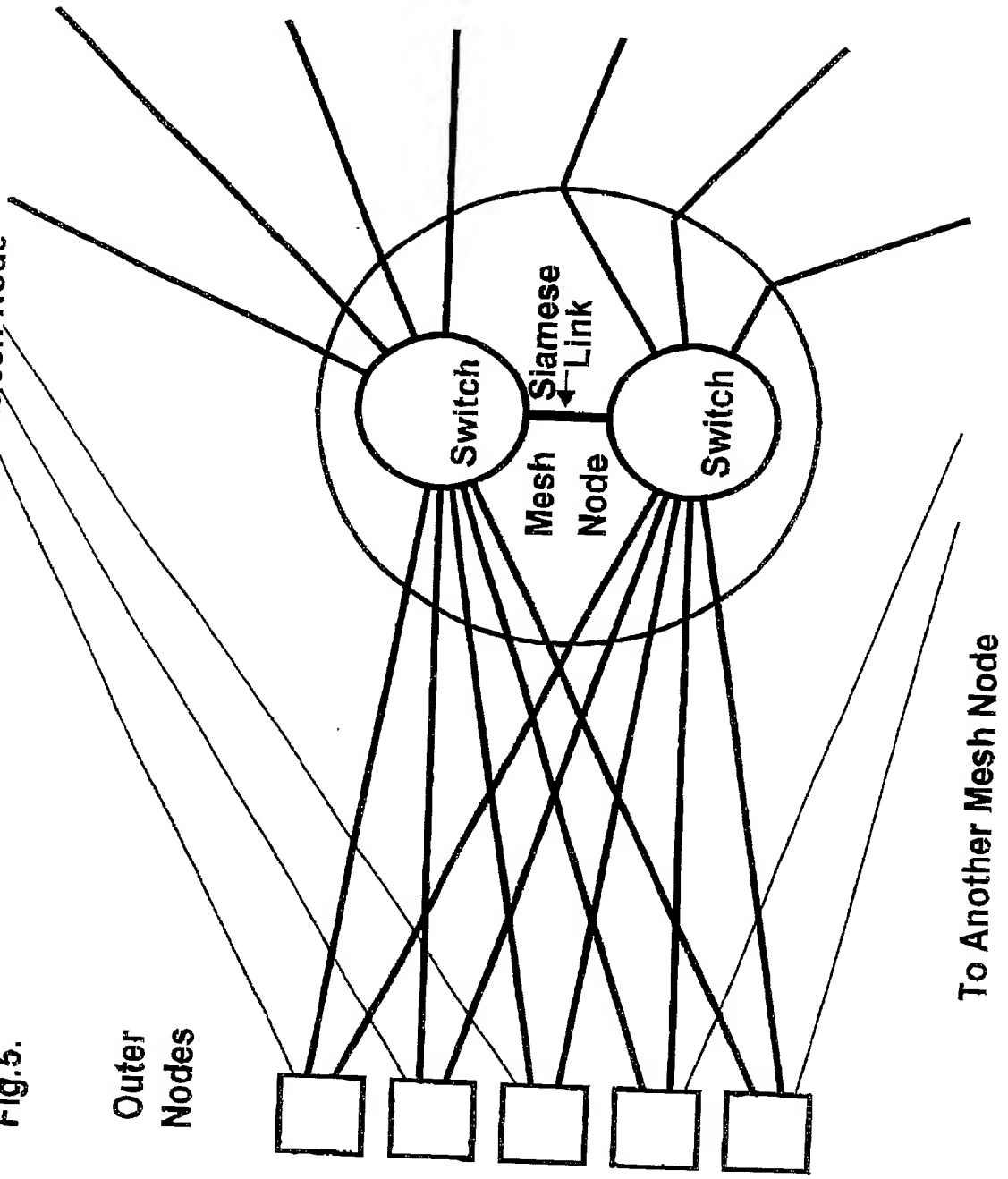
To Another Mesh Node
Switch
Siamese Link
Switch
Mesh Node
Outer Nodes
To Another Mesh Node

Fig.5.

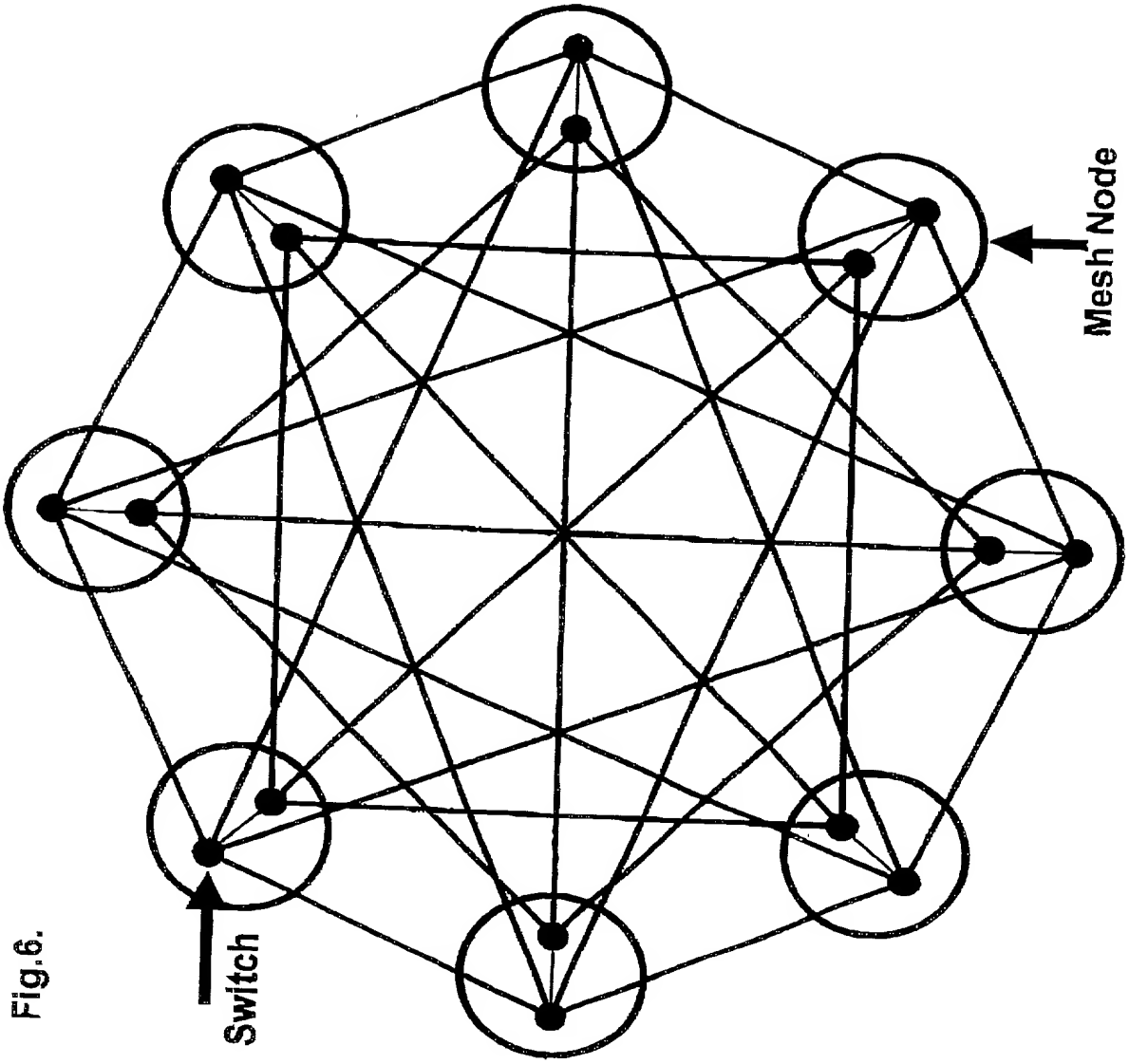

Fig.6.

PTO/SB/01 (6-95)
Approved for use through 9/30/98 OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Type a plus sign (+) inside this box → [+]

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PATENT & TRADEMARK OFFICE

0010/PTO Rev. 6/95 U.S. Department of Commerce Patent and Trademark Office

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

☐ Declaration Submitted with Initial Filing OR ☒ Declaration Submitted after Initial Filing

Attorney Docket Number	P/61815
First Named Inventor	CHOPPING
COMPLETE IF KNOWN	
Application Number	09/743,774
Filing Date	JANUARY 12, 2001
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled :

MESH NETWORKS

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) JANUARY 12, 2001 as United States Application Number or PCT International

Application Number 09/743,774 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119 (a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365 (a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
9913990.9	United Kingdom	06.17.1999	☐	☐	☒
0013323.1	United Kingdom	06.02.2000	☐	☐	☒
PCT/GB00/02237	PCT	06.08.2000	☐	☐	☒
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a supplemental priority sheet attached hereto.

Burden Hour Statement: This form is estimated to take .4 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Type a plus sign (+) inside this box → [+]

DECLARATION

Page 2

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority sheet attached hereto.

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

☐ Firm Name [ ] Customer Number or label [ ]

OR

☒ List attorney(s) and/or agent(s) name and registration number below:

Name	Registration Number	Name	Registration Number
David B. Kirschstein, Esq.	17,244		
Alan Israel, Esq.	27,564		
Martin W. Schiffmiller, Esq.	30,421		

☐ Additional attorney(s) and/or agent(s) named on a supplemental sheet attached hereto.

Please direct all correspondence to: ☐ Customer Number or label [ ] OR ☒ Fill in correspondence address below

Name: KIRSCHSTEIN, OTTINGER, ISRAEL & SCHIFFMILLER, P.C.

Address: 489 Fifth Avenue

Address:

City: New York State: New York ZIP: 10017-6105

Country: United States Telephone: (212) 697-3750 Fax: (212) 949-1690

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name	Middle Initial	Family Name	Suffix e.g. Jr.
Geoffrey		CHOPPING	

Inventor's Signature: Geoffrey Chopping Date: Sixth February 2001

Residence: City: Wimborne, GBX State: Country: United Kingdom Citizenship: British

Post Office Address: "Tregarth", Furzehill, Wimborne, Dorset, BH21 4HD, (GB) UK

Post Office Address:

City: Wimborne State: Zip: BH21 4HD Country: United Kingdom Applicant Authority:

☒ Additional inventors are being named on supplemental sheet(s) attached hereto

Type a plus sign (+) inside this box → [+]

DECLARATION

ADDITIONAL INVENTOR(S) Supplemental Sheet

Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

Given Name	Thomas	Middle Initial	S	Family Name	MADDERN			Suffix e.g. Jr.	
Inventor's Signature	Thomas Sholte Madder					Date	6-2-2001		
Residence: City	Wimborne GBX	State		Country	United Kingdom	Citizenship	British		
Post Office Address	38 Cutlers Place, Colehill, Wimborne, Dorset, BH21 2HU, (GB) UK								
Post Office Address									
City	Wimborne	State		Zip	BH21 2HU	Country	United Kingdom	Applicant Authority	

Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

Given Name		Middle Initial		Family Name				Suffix e.g. Jr.	
Inventor's Signature						Date			
Residence: City		State		Country		Citizenship			
Post Office Address									
Post Office Address									
City		State		Zip		Country		Applicant Authority	

Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

Given Name		Middle Initial		Family Name				Suffix e.g. Jr.	
Inventor's Signature						Date			
Residence: City		State		Country		Citizenship			
Post Office Address									
Post Office Address									
City		State		Zip		Country		Applicant Authority	

Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

Given Name		Middle Initial		Family Name				Suffix e.g. Jr.	
Inventor's Signature						Date			
Residence: City		State		Country		Citizenship			
Post Office Address									
Post Office Address									
City		State		Zip		Country		Applicant Authority	

☐ Additional inventors are being named on supplemental sheet(s) attached hereto